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of two sets of interior surfaces, that are equally pressed at all their points by the action of the exterior fluid, is inconsistent with Clairaut's theory, and is a proof of the insufficiency of that theory for determining the figure of a homogeneous planet.

January 27.

GEORGE RENNIE, Esq. V.P., in the Chair.

The following Presents were received, and thanks ordered for them :—

Views of the Pelvis, showing the Natural Size, Form and Relations of the Bladder, Rectum, Uterus, &c. in the Infant and in the Adult; taken from Preparations made for the Museum of the Royal College of Surgeons in Ireland. By John Houston, Esq. folio.—*Presented by the Author.*

An Account of two newly discovered Muscles for compressing the Dorsal Vein of the Penis, in Man and other Animals; and also of a similar Provision for compressing the Veins of the Chameleon's Tongue. By the Same. 8vo.—*The Author.*

Connaissance des Temps pour l'An 1833. 8vo.—*The Board of Longitude of France.*

L'Annuaire pour l'An 1831. 12mo.—*The Same.*

Bulletin de la Société Française de Statistique Universelle. Première Livraison. 4to.—*The Society.*

Statuts, et Liste des Membres, de la Société Française de Statistique Universelle. 8vo et folio.—*The Society.*

A paper was read, On the probable electric origin of all the phenomena of Terrestrial Magnetism; with an illustrative experiment. By Peter Barlow, Esq. F.R.S. Corr. Mem. Inst. France, and of the Imp. Acad. St. Petersburg.

The author begins his paper by a retrospect of the several discoveries on terrestrial magnetism made since the commencement of the present century. Humboldt, by his numerous and accurate observations on this subject, laid the foundation of all the scientific knowledge relating to it, which we hitherto possessed. The task of reducing these observations to definite principles, by subjecting them to calculation, was undertaken by Biot; and the conclusion which he drew from them was, that on the hypothesis of the earth's being a great magnet, the facts would best accord with the supposition that its two poles are coincident, or indefinitely near to each other, at the centre of the globe. The same result was also obtained, though by a different process of reasoning, by M. Kraft of St. Petersburg. It followed as a necessary consequence, that terrestrial magnetism observes a law different from that of a permanently magnetic body. but identical with that of a body in which transient magnetism is excited by induction. The law which obtains in the case of a sphere of iron rendered magnetic by induction was first investigated, in 1829, by Mr. Barlow; and also, by Mr. Charles Bonnycastle, Professor of

Mathematics in the University of Virginia ; it has since been amply confirmed by the more elaborate analytical investigations of Poisson. But the result of all these inquiries, instead of affording us clearer notions of the action of terrestrial magnetism, tended rather to perplex and obscure our views respecting its nature and operation.

While our knowledge was in this imperfect and almost retrograde state, a new light broke in upon us in the great discovery of Oersted, which, by disclosing the intimate relation which electricity bears to magnetism, must be regarded as forming a new era in the history of this department of physical science. The operation of the tangential force between a galvanic wire and a magnetic needle was pointed out by the author, in a paper which was read to the Royal Society in the year 1822 ; and was still more fully examined by M. Ampère, who extended the investigation to the law of the reciprocal action of galvanic currents on one another ; and thence deduced a general theory of magnetic action.

Having established the general fact that the magnetism which is induced on an iron ball resides only on its surface, and acts according to the same laws as the magnetic influence of the earth, the author was desirous of ascertaining whether he could succeed in imitating the effects of terrestrial magnetism by distributing galvanic currents round the surface of an artificial globe. This conjecture he put to the test of experiment, by having a hollow wooden globe constructed, sixteen inches in diameter, with grooves cut at all the parallels of latitude distant by 10° from each other. Copper wires were then laid in these grooves, and disposed so as to allow of the transmission of a galvanic current in similar directions through the whole system of these circular wires. This being effected, it was found that a magnetic needle, properly neutralized, so as to be exempt from all influence from the earth, and freely suspended in different situations on the surface of this artificial globe, assumed positions exactly analogous to those of the dipping-needle in different parts of the earth. The author has no doubt that if the electrical currents in this experiment could be increased indefinitely, the apparatus might be made accurately to represent every circumstance of magnetic dip and direction actually observed in nature.

It thus appears that all the phenomena of terrestrial magnetism may be produced by electricity alone : for it is evident, that in place of the needle employed in the experiment above described, the galvanic needle of Ampère might have been substituted, to the complete exclusion of the only magnetic part of the apparatus.

The discovery of Seebeck, that heat applied to a circuit of metallic conductors develops galvanism, and consequently gives rise to magnetic induction, supplies another link in the chain of evidence, that terrestrial magnetism is purely an electrical phenomenon, deriving its origin, during the diurnal revolution of the earth, from the action of the sun's rays on successive portions of its surface, in directions parallel to the equator. The probability, therefore, is now much increased, that magnetism is a quality not essentially distinct from electricity.